Available online at www.sciencedirect.com

ScienceDirect

Procedia Social and Behavioral Sciences 15 (2011) 3205–3210

Procedia Social and Behavioral Sciences

WCES-2011

A map of factors influencing reading literacy across European countries: direct, indirect and moderating effects

Fabio Alivernini[a]*, Fabio Lucidi[b], Sara Manganelli[a], Ines Di Leo[a]

[a]*National Institute for the Educational Evaluation of Instruction and Training (INVALSI), via Borromini 5 - Villa Falconieri -, 00044 Frascati (RM), Italy*

[b]*Department of Social and Developmental Psychology, University of Rome 'La Sapienza', via dei Marsi 78, 000185 Rome, Italy*

Abstract

PIRLS 2006 collected data about reading literacy and various factors connected to educational policies and school, family and student contexts, using a large sample of European fourth grade students. The aim of the present study is to examine, for European data (N = 96177), the interplay between educational policy, school, teacher, family and student factors, and their relationships to reading literacy. A structural equation model (SEM) comprising school, teachers, parents, and pupils variables is developed and tested. The influence of curriculum policies in various European countries was tested in terms of an interaction effect by means of multiple samples SEM.

Keywords: Multigroup structural equation modeling, reading literacy, PIRLS 2006;

1. Introduction

The Progress in International Reading Literacy Study (PIRLS) was a study conducted under the coordination of the International Association for the Evaluation of Education Achievement (IEA) which aimed to provide internationally comparative data about reading literacy in primary school, focusing on the achievement of children in the fourth year of schooling and their experiences in learning to read at school and at home. PIRLS 2006 included 19 European Countries and it was the second, after PIRLS 2001, in a cycle of international assessments carried out every five years. According to the multi-perspective approach of its conceptual framework (Mullis, Kennedy, Martin, & Sainsbury, 2006), the aims of PIRLS 2006 were to conduct an innovative and comprehensive assessment of reading achievement. This is done within the context of large-scale international data collection (Gnaldi, Schagen, Twist, & Morrison, 2005), taking into account the influence of the various different contexts in which children learn to read, and attempting to identify the factors, or combinations of factors, associated with reading literacy scores (Papanastasiou, 2008). To provide a sufficient context for assessing and interpreting students' reading literacy, PIRLS collects an extensive range of test and questionnaire data from students as well as from their parents, teachers, and school principals (Mullis, Martin, Kennedy, & Foy, 2007). In addition, the PIRLS 2006 Encyclopedia (Kennedy, Mullis, Martin, & Trong, 2007) provided important information about different countries' policies

* Fabio Alivernini
E-mail address: fabio.alivernini@invalsi.it.

1877–0428 © 2011 Published by Elsevier Ltd. Open access under CC BY-NC-ND license.
doi:10.1016/j.sbspro.2011.04.272

regarding the reading curriculum, which helped to understand the different European contexts for the teaching and learning of reading in the primary grades. In fact, the various European education systems differ as regards their policies and practices in reading instruction and there is a major distinction (Kennedy, Mullis, Martin, & Trong, 2007) between countries with a national reading curriculum and countries which do not have one.

1.1. Purpose of the study

The specific objective of the present study was to examine, by means of Structural Equation Modeling (SEM), the relationships between curriculum policies and school, teacher, family and student factors, and their influence on reading achievement across European countries. Different models of how different factors affect reading achievement were examined, taking also their indirect effects into consideration. The main research question we asked about European curriculum policies was: does having a national reading curriculum have any effect on the relations specified in the model of factors influencing reading literacy?

2. Methods

2.1. Participants and procedures

This study is based on a sample of 96177 fourth grade pupils, their parents, and their corresponding teachers (N = 5228) and principals (N = 3399) who took part in PIRLS 2006 in European countries.

2.2. Instrumentation and variables

PIRLS 2006 Questionnaires data provided information on a number of factors measuring various elements of the educational context influencing reading achievement. These constructs refer to characteristics of schools, teachers, parents, and pupils. For detailed information on these constructs and variables please see "PIRLS 2006 Technical Report" (Martin, Mullis, Kennedy, 2007). In Table 1 variables used in the structural model are reported and briefly described.

Table 1. Description of variables used in the structural model

Variables	Description
Early home literacy activities (3 items–latent variable)	Parents' reports about engaging in early literacy activities with the students before they began primary school. (e.g. reading books, telling stories).
Home educational resources (3 items–latent variable)	Students' and parents' reports about the number of books in the home (*e.g. About how many books are there in your home? About how many children's books are there in your home?*) and the highest level of education completed by the parents.
Home economic resources (1 item–observed variable)	Parents' responses to the question "*Compared with other families in <country>, how well-off do you think your family is financially?"*
Parents' attitudes toward reading (3 items–latent variable)	Parents' preferences for reading. (*e.g. I like talking about books with other people; I like to spend my spare time reading*)
Presence of qualified teaching staff (1 item–observed variable)	Principals' reports of how much the school's capacity to provide instruction is affected by the presence of a qualified teaching staff.
Availability of school material resources (3 items–latent variable)	Principals' reports of how much the school's capacity to provide instruction is affected by a shortage or inadequacy of the tangible resources (e.g. *instructional materials and supplies, furniture).*
Frequency of reading homework (1 item–observed variable)	Teachers' responses to the question "*How often do you assign reading as part of homework (for any subject)?"*

Time spent by students in reading activities at school (2 items–latent variable)	Teachers' reports of time spent on language instruction or reading activities in a week *(e.g. In a typical week, how much time do you spend on <language of test> language instruction and/or activities with the students? Regardless of whether or not you have formally scheduled time for reading instruction, in a typical week about how much time do you spend on reading instruction and/or activities with the students?)*
Teachers' career satisfaction (3 items–latent variable)	Teachers' reports of satisfaction with their current position and career choice (e.g. *I am satisfied with being a teacher at this school, I am content with my profession as a teacher*)**.**
Students' attitudes toward reading (3 items–latent variable)	Students' reading preferences (e.g. *I like talking about books with other people, I would be happy if someone gave me a book as a present).*
Students' reading self-concept (2 items–latent variable)	Students' perceptions of their own reading competencies compared with their classmates (e.g. *I do not read as well as other students in my class; I read slower than other students in my class*).

2.3. Data Analysis

To evaluate the extent to which the hypothesized structural model supports the observed data, we relied on multiple indices of fit such as the comparative fit index (CFI; Bentler, 1990), the root mean square error of approximation (RMSEA; Steiger, 1990), etc. We further tested the hypothesized model against a series of possible alternative models (Bentler, 1990).

2.3.1. The tested model

In the present study, the model is formulated according to the PIRLS' conceptual framework and takes into consideration environmental and personal factors. In this model, home educational resources and home economic resources are correlated and they directly predict parents' attitudes toward reading, early home literacy activities, students' reading self-concept, students' attitudes toward reading and reading literacy. Parents' attitudes toward reading and early home literacy activities have a direct impact on students' attitudes, as well as on reading literacy. Early home literacy activities also have a direct impact on students' reading self-concept. As regards school factors, the availability of materials and resources at school is directly connected to reading literacy, to teacher career satisfaction and to the presence of qualified teaching staff. This factor also has a direct influence on teacher career satisfaction, the frequency with which reading tasks are assigned for homework and on the amount of time children are engaged in activities associated with reading at school. All factors connected with teachers (i.e. teacher career satisfaction, the time spent by students in activities associated with reading at school, and the frequency of reading tasks which are assigned for homework), have a direct impact on students' reading self-concept, students' attitudes toward reading and on reading literacy. As regards as factors connected with students, students' reading self-concept and students' attitudes toward reading are correlated and they directly influence reading literacy.

3. Results

The specified model had goodness-of-fit indexes as follows: χ^2 = 49460 (495 df) p = .01, TLI=.95, IFI=.96, CFI = .96, RMSEA= .02. Structural coefficients from the completely standardized solution under maximum likelihood are displayed in Figure 1.

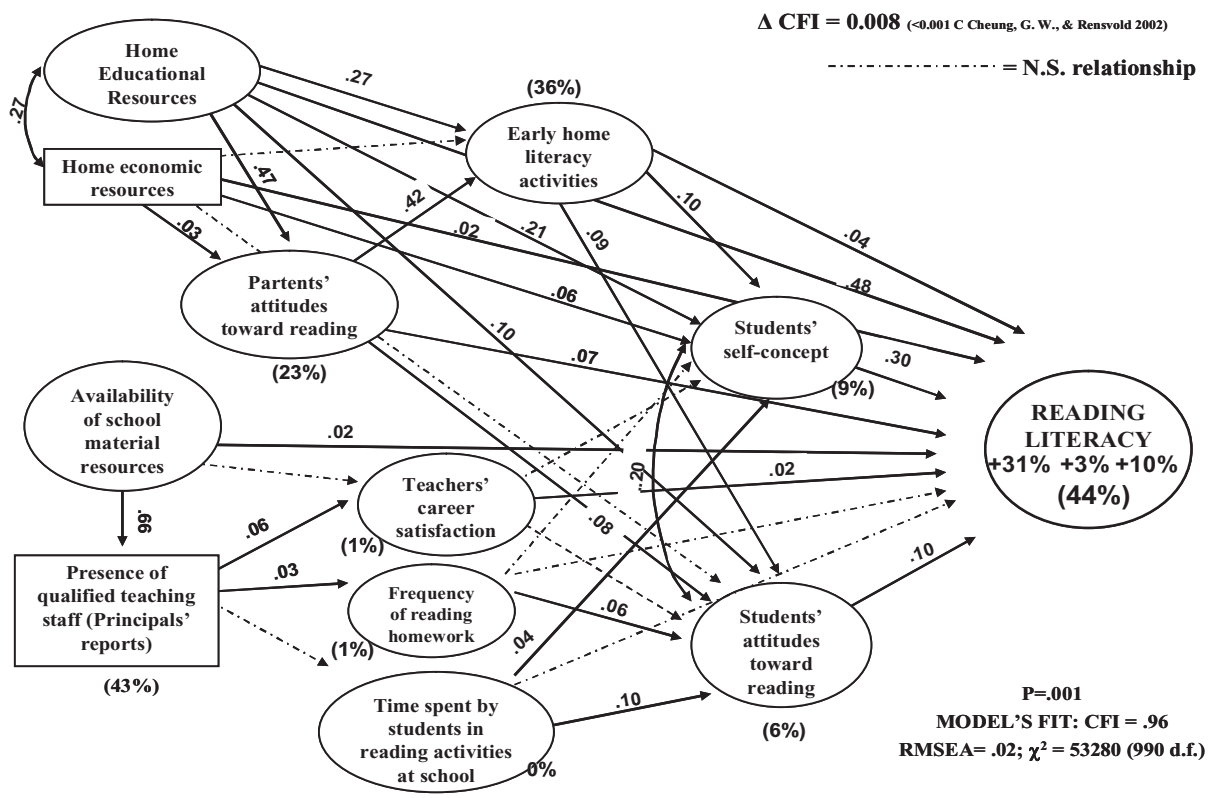

Figure 1. Results

The proposed model as a whole accounted for 44% of variance of reading literacy in European fourth grade pupils. In the final model home variables accounted for 31% of variance, students' variables for 10% and school and teacher variables for 3% of variance.

To examine the equivalence of the model structure across different subgroups (European countries with a reading curriculum and European countries without a reading curriculum) we carried out additional analyses. Specifically, we compared a baseline model, which allowed parameters to be independently estimated in each subgroup, with alternative nested models, in which the major parameters (i.e., measurement and the structural weights were constrained to be equal across the subgroups).

Table 2 reports the results of these analyses. As can be seen, all nested models had a reasonable fit. Although the chi-square difference was statistically significant for the comparison, the differences in CFI were smaller (.008) than the cut-off criterion of .01 suggested by Cheung and Rensvold (2002). These results indicate that the model structure was invariant across European countries with a national curriculum which covers reading literacy and European countries without this type of curriculum.

Table 2. Equivalence of the factor structure of the scales across different subgroups of European Countries

Subgroup Comparison	Baseline Model	Nested Model (Measurement weights and structural weights)	Δ χ^2 (df)	Δ CFI
Presence of national reading curriculum vs. Absence of national reading curriculum				
χ^2 (df)	53280 (990)	64507 (1076)	11227 (86) p<.01	.009
CFI	.96	.952		
RMSEA	.023	.024		

4. Discussion and Conclusion

This study utilized structural equation model (SEM) to explore factors, at school, teacher, family and student level, that directly and indirectly influence pupils' reading literacy across European Countries.

The results show that, as a whole, the final model accounted for a considerable size of variance (44%) of reading literacy in European fourth grade pupils.

More specifically the overall effect of home variables in producing designated levels of reading literacy was large: they accounted for the 31% of reading literacy variance. An important part of this effect is related to the direct and indirect influence (through other variables) of educational resources, whereas the importance of economic resources seems to be very small in total.

As regards variables connected with students (students' attitudes toward reading and students' reading self-concept) they seem to strongly modulate the effect of home variables. It is also important to note that the addition of these two variables to the model, which are only partially (9% and 6%) explained by the variables they mediate, can help us to explain a substantial proportion of variance in the scores of reading literacy (+10%).

As concerns the school and teachers variables, they explain a small proportion of variance (3%). The material resources available in schools have a very small effect on reading literacy. This effect increases slightly if these material resources attract qualified teachers. In this context, the most important variable proves to be the time spent by students in reading activities at school which proves to have only an indirect effect on reading literacy, mediated by students' attitudes toward reading and students' reading self-concept. Finally as regards curriculum polices in European countries, our data show that the presence or the absence of a national reading curriculum does not affect in a substantial way the relations specified in the model of factors influencing reading literacy.

A result that deserves attention is related to the low level of influence of school variables on the reading skills of students in their fourth year of schooling across all European countries. How can we interpret this low degree of influence? It is likely that for students in their fourth year of school (mostly between 8 and 10 years of age) out-of-school variables (in particular those related to the socio-family context) have a strong influence on reading literacy (Park, 2008). This is also consistent with studies which have shown the particular importance of family as environmental factor in scholastic development for children of primary school (e.g. Bailey, Silvern, Brabham, & Ross, 2004; Cooper, Jackson, Nye, & Lindsay, 2001; Hoover-Dempsey et al., 2001; MCElvany & Van Steensel, 2009;).

The fact that, as regards the map of factors influencing reading literacy, there are no substantial differences between those European countries where a curriculum for reading is explicitly provided and those where such curricular provisions are absent, would seem to support this type of interpretation. However, this result should be interpreted with caution, especially when taking into account the difference between intended curriculum and implemented curriculum (which is considered as a central factor in the IEA investigation): The mere presence of a national curriculum does not guarantee an equal level of development of teaching-learning within a national school system as a whole. This consideration could however constitute an incentive to improve and enhance the national options and the European options within the surveys, so that they are particularly focused on those variables of the school context that might be particularly important within each country and within Europe. Finally one should note

that the proposed model, even if it is consistent with the PIRLS 2006 theoretical framework and fits the data quite well, is just one of a number of plausible models: future studies should explore other possible scenarios.

References

Bailey, L.B., Silvern, S.B., Brabham, E., & Ross, M. (2004). The effects of interactive reading homework and parent involvement on children's inference responses. *Early Childhood Education Journal, 32*(3), 173–178.

Bentler, P.M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107,* 238-246.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling*, *9*, 233–255.

Cooper, H., Jackson, K., Nye, B., & Lindsay, J.J. (2001). A model of homework on the performance evaluations of elementary school students. *The Journal of Experimental Education, 69*,181–199

Gnaldi, M., Schagen, I., Twist, L., & Morrison, J. (2005). Attitude items and low ability students: The need for a cautious approach to interpretation. *Educational Studies*, *31*(2), 103–113.

Hoover-Dempsey, K.V., Battiato, A.C., Walker, J.M.T., Reed, R.P., De Jong, J.M., & Jones, K.P. (2001). Parental involvement in homework. *Educational Psychology*, *36*, 195–2009.

Kennedy, A.M., Mullis, I.V.S., Martin, M.O., & Trong K.L. (Eds). (2007). *PIRLS 2006 Encyclopedia: A Guide to Reading Education in Forty PIRLS 2006 Countries*. Chestnut Hill, MA: Boston College.

Martin, M.O., Mullis, I.V.S., Kennedy, A.M. (2007). *PIRLS 2006 Technical Report.* Chestnut Hill, MA: Boston College.

McElvany, N., Van Steensel, R. (2009). Potentials and challenges of family literacy interventions: the question of implementation quality. *European Educational Research Journal, 8*(3), 418-433

Mullis, I.V.S., Kennedy, A.M., Martin, M.O., & Sainsbury, M. (2006). *PIRLS 2006 assessment framework and specifications* (2nd ed.). Chestnut Hill, MA: Boston College.

Mullis, I.V.S., Martin, M.O., Kennedy, A.M., & Foy P. (2007). *PIRLS 2006 International Report: IEA's Progress in International Reading Literacy Study in Primary School on 40 countries*. Chestnut Hill, MA: Boston College

Park, H. (2008). Home literacy environments and children's reading performance: a comparative study of 25 countries. *Educational Research and Evaluation*, *14*(6), 489–505.

Papanastasiou, C. (2008). Factors distinguishing most and least effective schools in terms of reading achievement: a residual approach. *Educational research and Evaluation, 14*(6), 539–549.

Steiger, J. H. (1990). Structural model evaluation and modification: an interval estimation approach. *Multivariate Behavioral Research, 25* (2), 173-180. http://www.informaworld.com/smpp/title~content=t775653673~db=all~tab=issueslist~branches=25 - v25